REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

The claims have been amended responsive to the rejection under 35 U.S.C. 112. Specifically, Claims 1-13 no longer recite a fuel cell which has been used for an extended period of time, but instead recite a fuel cell whose output has undergone a change over time. Basis for this is found in paragraphs [0004] and [0006]. This rejection is therefore believed to be moot.

Claims 1-3, 7-9, 11-13 and 40 were again rejected under 35 U.S.C. 102 as being anticipated by Hirashima. Claim 41 was rejected under 35 U.S.C. 103 as being obvious over Hirashima. However it is respectfully submitted that Claims 1-13 clearly define over this reference because there is no teaching in Hirashima for estimating the output characteristic of a fuel cell whose output has undergone a change over time.

The output characteristic of a fuel cell can change over time. The actual output of the fuel cell may therefore be unable to satisfy a rated load, and must be estimated. The present invention estimates the actual output characteristics of a fuel cell whose output has undergone a change over time on the basis of a detected output current, a detected voltage between the terminals of the fuel cell, and a predetermined basic output characteristic of the fuel cell. Hirashima, on the other hand, does not estimate the output characteristics of a fuel cell whose output has undergone a change over time but instead attempts to cause the output voltage and current to approach their respective reference values.

More specifically, Hirashima is concerned with the possibility of an overload of the fuel cell between the time that a load increase is commanded and a time that the fuel cell temperature reaches a stable value (col. 2, lines 18-31). The I-V characteristic curve of a fuel cell is dependent on its temperature as shown in Fig. 2 of the reference (see also col. 3, lines

52-55; col. 6, lines 29-32). This can produce difference between the actual and reference current and voltage values until the actual fuel cell temperature reaches the reference temperature.

Hirashima therefore adds an extra amount "q" to the reference fuel flow rate (Fig. 4) to compensate for the reduced voltage due to a low fuel cell temperature until the fuel cell temperature has reached a steady state operating temperature (col. 7, lines 8-39). Hirashima describes that the fuel cell is controlled by current value control in steady state conditions, wherein the fuel gas supply is determined by the output current value (col. 6, lines 19-24). Upon the receipt of an increased load demand, a reference current at a given temperature corresponding to the load demand is calculated based on the graph of Fig. 5 (col. 6, lines 25-34), which then determines a reference fuel flow rate Q. However, since the actual fuel cell temperature is less than that for the calculated reference flow rate, the extra amount "q" is added to the reference fuel flow rate Q until the fuel cell temperature reaches the reference level (col. 7, lines 9-56).

Thus the teaching of Hirashima is that the estimated output characteristic of a fuel cell is dependent on the fuel cell temperature only. Accordingly, if the fuel cell temperature remains constant, Hirashima teaches that the output characteristic of the fuel cell will remain unchanged at a given fuel flow rate.

As to the assertion in the Office Action that estimation of the output characteristic of a fuel cell whose output has undergone a change over time is taught in Hirashima by the change in the output power reference value P between times t1 and t2 in Fig. 4 thereof (see Office Action, paragraph 7), it is noted that this does not represent a change in the output characteristic of the fuel cell, but only a change in a reference value, which is to be matched by changes in the fuel flow rate and not by changes in the output characteristics of the fuel cell. Hirashima

therefore lacks the claimed feature of a controller that estimates the output characteristic of the fuel cell whose output has undergone a change over time.

Claims 40 and 41 recite that the predetermined basic output characteristic is a function of an internal resistance of the fuel cell. The Office Action asserts that this is inherent in Hirashima because the internal resistance and current are inversely proportional to each other, so the estimation of the current would be inversely proportional to the internal resistance. However the output current of a fuel cell is not the simple inverse of its internal resistance. Instead, as is evident from Fig. 4 of Hirashima, the output current of the fuel cell is the product of a number of factors including the fuel flow rate and the fuel cell temperature. Therefore the calculation of a reference output current does not inherently calculate a fuel cell internal resistance, and the calculation of a reference output current in Hirashima is not evidence of estimating the output characteristic of a fuel cell on the basis of a predetermined basic output characteristic which is a function of an internal resistance of the fuel cell.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early notice of allowability.

Respectfully submitted,

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